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ABSTRACT

A statewide study in Louisiana revealed that third, fourth, and fifth graders who participated in 30-minute elementary school foreign language programs in the public schools showed significantly higher scores on the 1985 Basic Skills Language Arts Test than did a similar group that did not study a foreign language. Further, by fifth grade, the math scores of language students were also higher than those of students not studying a foreign language. Both groups were matched for race, sex, and grade level, and the academic levels of students in both groups were estimated by their previous Basic Skills Test results and statistically equated. The 13,200 students studied were randomly chosen from those who had not been exposed to a foreign language at home, were fluent in English, had not repeated a grade in 1985, and whose 1984 and 1985 test scores were available. The results of the analysis suggest that foreign language study in the lower grades helps students acquire English language arts skills and, by extension, math skills. (Author/MSE)

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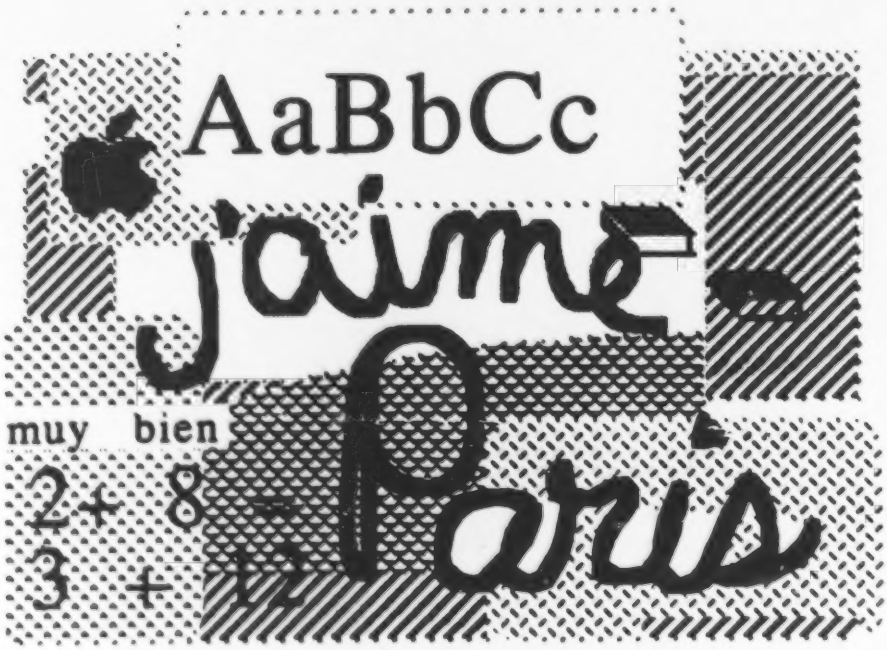

Prepared by Eileen A. Rafferty, Ph. D.

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February, 1986

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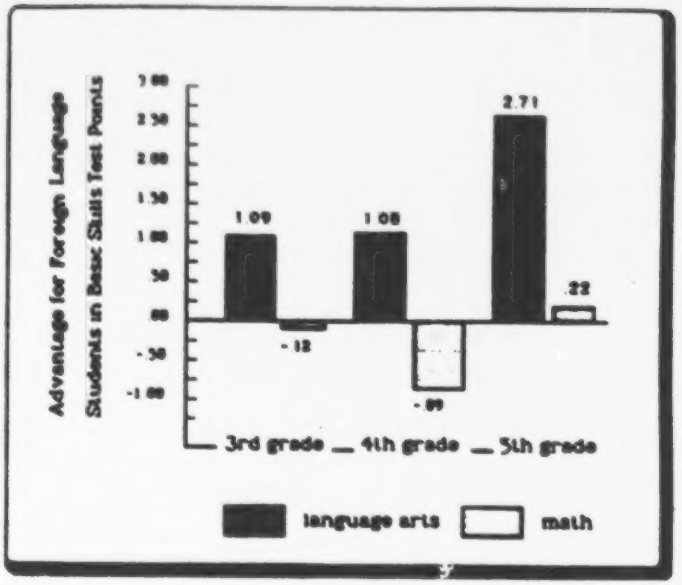
Second Language Study and Basic Skills in Louisiana

Abstract

Third, fourth and fifth graders who participated in second language study in Louisiana's public schools showed significantly higher scores on the 1985 Basic Skills Language Arts Test than did a similar group of non-participants. Additionally, by fifth grade the math scores of participants were also higher than those of nonparticipants. Second language and no second language students were matched for race, sex, and grade level. The academic level of students in both groups was estimated by their previous Basic Skills Tests results and statistically equated.



The 13,200 students in this analysis were randomly chosen from among those who had not been exposed to a foreign language in the home, had not repeated a grade in 1985, and whose 1984 and 1985 test results were available.

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Second Language Study and Basic Skills in Louisiana

One result of the current national outcry for excellence in education has been renewed public interest in foreign language instruction at the elementary level. In November of 1985 the Council of Chief State School Officers concluded a five-day conference by unanimously adopting a policy which would ensure that education in the future have "an international dimension." A keystone of the program is the endorsement of foreign language study beginning in the elementary schools and continuing through college. According to a recent Media General-Associated Press poll (January, 1986), the majority of Americans concur. Of the 1,462 respondants, 84 percent said second language should be taught in elementary schools (Figure 1). As American business faces increasing competition from graduates of the many excellent school systems abroad, language skills and facility in understanding social and cultural differences have become a priority. Linguists cite many comprehensive studies (e.g., Lambert, 1967, 1978) in support of the notion that early foreign language instruction promotes sociocultural awareness and prosocial behaviors, especially in bilingual communities such as exist in parts of Louisiana.

Although most curricular specialists endorse foreign language instruction, some controversy exists as to when it should start, which children would benefit most, and whether the always limited resources of time and money would not be better allocated to instruction in minimum skills. Proponents of early instruction argue that the cognitive consequence of foreign language study may have a positive impact on basic skills acquisition. In theory, exposure to a second language at the elementary level increases a student's general cognitive level insofar as he becomes aware that a word and the thing it represents are independent entities. This is thought to enable a student to reach a level of

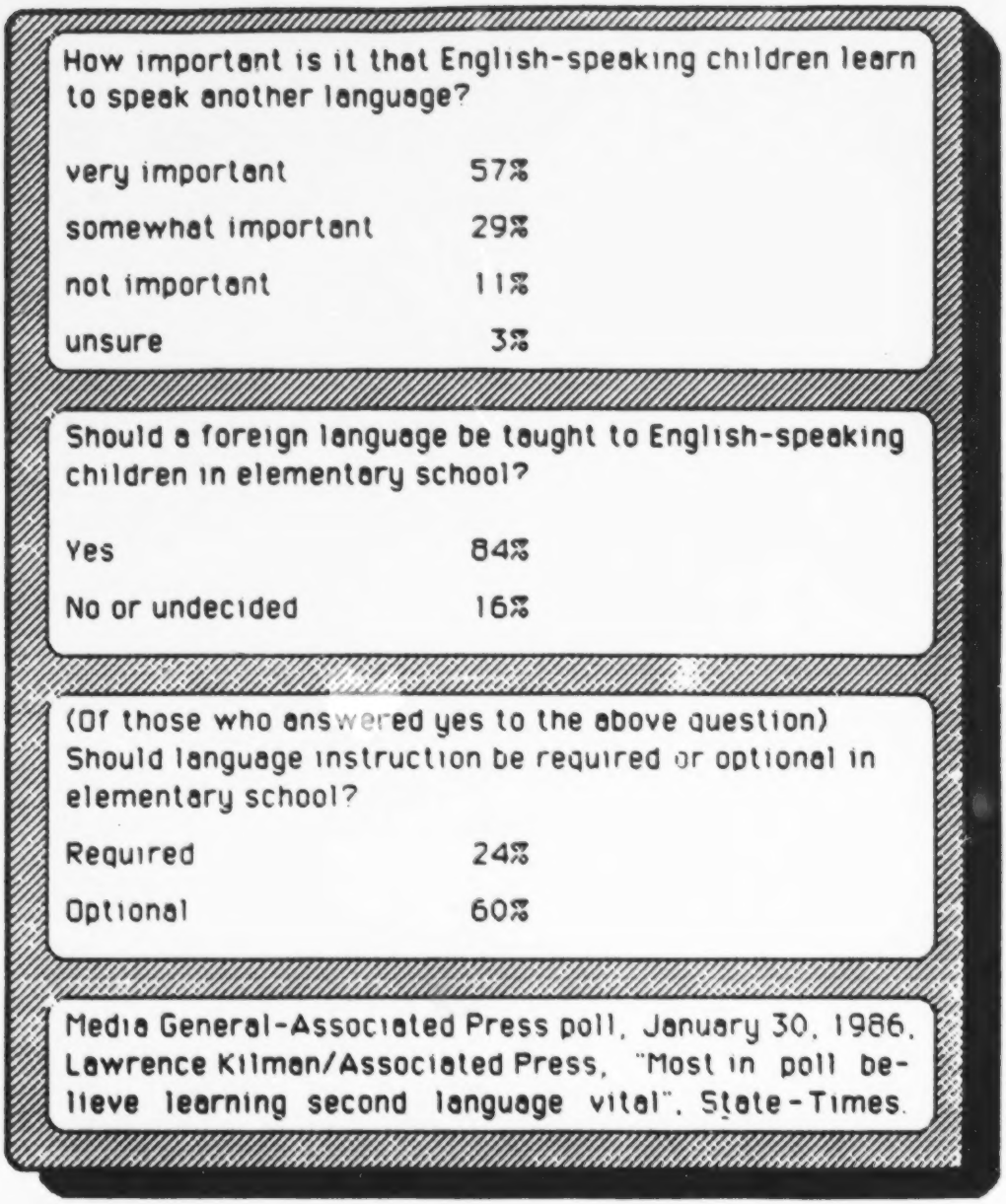
How important is it that English-speaking children learn to speak another language?
very important 57%
somewhat important 29%
not important 11%
unsure 3%
Should a foreign language be taught to English-speaking children in elementary school?
Yes 84%
No or undecided 16%
(Of those who answered yes to the above question) Should language instruction be required or optional in elementary school?
Required 24%
Optional 60%
Media General-Associated Press poll, January 30, 1986. Lawrence Kilman/Associated Press, "Most in poll believe learning second language vital", State-Times.

Figure 1. The results of a nationwide poll of 1,462 citizens regarding their opinions of foreign language instruction.

abstraction not otherwise so readily available (Lambert, 1981). Abstraction of this kind is particularly important in studying mathematics, in which an early goal is to promote what psychologists refer to as conservation of quantity. That is, the child must appreciate that, if confronted with two elephants and two hamsters, there is not a greater number of elephants than hamsters. Simple though the concept may be, it is not always immediately apparent to children and may even have to be rediscovered, on a more sophisticated level, as the student progresses through arithmetic. General cognitive functioning, as well as exposure to parallel language systems, is often linked to increases in native language skills, especially as concerns facility in extemporaneous speaking (Lambert, 1979). On the other hand, some investigators have concluded that, even under the very best conditions, foreign language students may initially lag their counterparts in some areas, including basic literacy skills in the native language (Dolson, 1984). To avoid cognitive confusion, Dolson suggests that educators postpone foreign language instruction until the student is functionally literate in the native tongue.

Several investigators have attempted to detect the impact of elementary foreign language programs on minimum skills acquisition in Louisiana. Most attention has been focused on foreign language immersion programs in which subject areas other than foreign language are taught to native speakers of English in the second language being learned. Johnell M. Matthews (1985) of East Baton Rouge Parish compared the 1985 language and mathematics Basic Skills scores of third and fourth grade foreign language (FL) pupils with those of pupils who had not recieved foreign language (NFL) instruction at the La Belle Aire Elementary School. The results show the immersion students to be superior at each grade level and subject area. A similar study by Peggy A. Pugh (1985) of Calcasieu Parish measured the scores of FL and NFL children at the Prien Lake

and Gillis Elementary Schools. Pupils in first grade French immersion classes outperformed NFL pupils in both reading and mathematics on the SRA Achievement Series tests. James E. Barr (1984) of the Louisiana Department of Education conducted the first statewide investigation of the effect of the more common 30-minute foreign language programs. His results showed that pass rates in both math and language arts on the Basic Skills Tests were higher for second, third, and fourth grade FL students.

Studies such as these are complicated by several factors, some of which are unique to Louisiana. For economic reasons, foreign language programs are not funded in some districts, and, consequently, immersion programs such as the one at La Belle Aire Elementary School in East Baton Rouge Parish, are rare. Studies of the more typical, 30-minute programs are infrequent.

State foreign language officials indicate that students presently enrolled in foreign language are not limited to those at or above grade level, and that a high level of parental involvement is not a criterion for program implementation. Because of this, they believe that FL students represent a wide range of academic talent. Nevertheless, in some programs in some schools, placement in FL may favor those with at least minimum grade level reading skills and/or parental commitment to the second language program. In these cases, there may be some doubt whether the higher scores for FL students in the previously cited studies are due to their FL coursework or to the fact that their numbers tend to include fewer slow students or fewer whose parents are not involved.

Because some Louisiana school children speak a foreign language at home, it is not clear whether any benefits which might accrue from foreign language study at school are the result of the state's educators or an enriched linguistic environment at home.

Finally, the Basic Skills tests are different for each grade level and sub-

ject area. To enable a valid comparison across these variables it is necessary to equate the difficulty level of each test.

The present study addresses the issues previously outlined. No students are included who speak a foreign language at home or have limited English fluency. Only school systems and grades which provide second language instruction are included. Academic talent is estimated using Basic Skills test scores from the previous year, and is statistically adjusted. Each of the Basic Skills tests is equated for difficulty level to allow for valid comparisons across grade levels and subject areas. In order to determine whether second language instruction has different effects on different subgroups of students, both FL and NFL groups are matched for race, sex, and grade level.

Methods

Subjects: The students were chosen from among third, fourth, and fifth grade regular education in Louisiana's public schools.

In order to ensure that any beneficial effects of foreign language learning were due to the influence of the school-based foreign language curriculum rather than from having learned a second language at home, students who were not fluent in English, or who had reported that a language other than English was spoken at home, were excluded.

The analyses required data from both the 1984 and the 1985 administrations of the Basic Skills Tests. Students were excluded from the study if their scores from both years were not available. Scores from both years were matched for approximately 60 percent of the populations involved. Data from 1984 and 1985 were considered to be from the same student if the student's first name, last name, school, race, sex, and date of birth were the same for both years, and if he was either in the same grade or one grade advanced in 1985.

Because 1985 was the first year in which the fifth grade Basic Skills tests

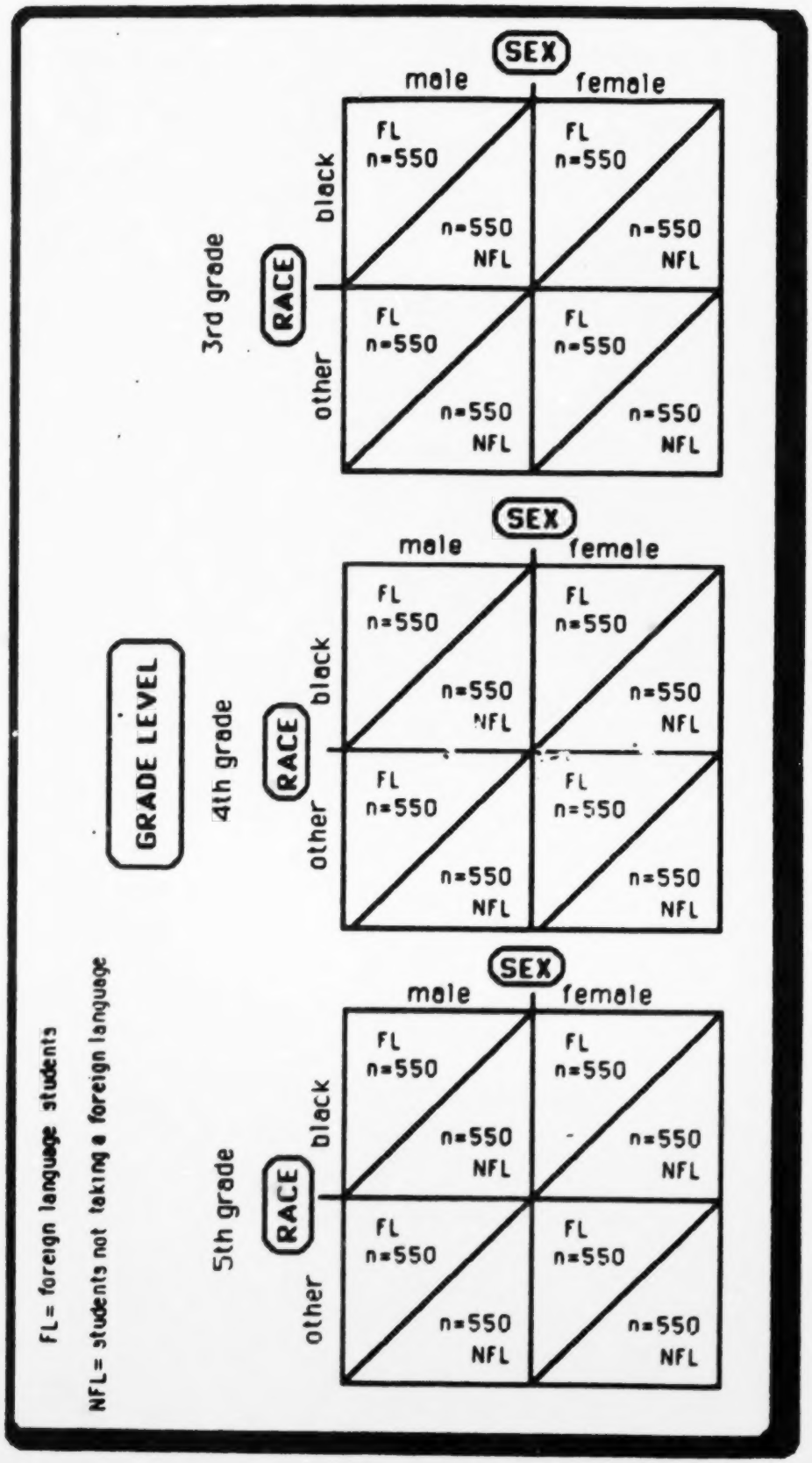

Figure 2. Design and subject selection.

were administered, no 1984 data were available on those students who had repeated the fifth grade. Fifth graders, who in 1985 were repeating the fifth grade, would not have taken the previous year's fourth grade test. When comparing results across grade levels, it is imperative that each level be given an equal opportunity to succeed. If, in comparing fifth grade results with those of other grades, it was found that fifth graders did better, one would not be able to say whether that result was due to the fact that 1) fifth graders profit more from foreign language, or 2) there were no students who had repeated in the fifth grade sample, whereas there were students who had repeated in the samples of other grades. Thus, students who had repeated a grade in 1985, regardless of grade level, were excluded.

Finally, students who were from school systems, and from certain grades within these school systems, in which there was no foreign language program were excluded. This enabled a comparison of FL students with those of their NFL peers in the same school districts.

Taking into account the above exclusions, a database was constructed containing the variables race, sex, 1985 grade level, second language participation or nonparticipation, and raw scores on both the 1985 and 1984 Basic Skills tests for every student. Randomly chosen from the database were 550 students for each cell of the design. The total number of students in the analyses was 13,200.

Instruments: The Louisiana Basic Skills Tests are criterion-referenced instruments designed to measure core curriculum mastery in language arts and reading. The tests were constructed to permit the interpretation of individual and group scores in relation to a clearly defined domain of content. The content domains were specified by defining objectives within the state curriculum to be performed by the test taker. Measurements are taken on samples of these

objectives (four items per objective), and such measurements are referenced directly to the domain. Test specifications, based directly on Louisiana's official curriculum, and technical reports are available from the Bureau of Accountability, Louisiana Department of Education, P. O. Box 94064, Baton Rouge, LA 70804-9064.

Design: The design was a four-way factorial analysis of covariance with two covariates. The levels of each independent variable were as follows:

1. RACE:	black or other	(2 levels)
2. SEX:	male or female	(2 levels)
3. GRADE:	3rd, 4th, 5th in 1985	(3 levels)
4. SECOND LANGUAGE:	FL or NFL	(2 levels)

The total number of possible combinations of the above levels represents the total number of possible distinguishing characteristics among students in this study and is equal to (2 x 2 x 3 x 2) or 24. From each of these 24 different types of students, 550 were chosen, bringing the total number of students in the analyses to (550 x 24) or 13,200 subjects (Figure 2). The covariates were 1984 Basic Skills tests in math and language arts.

Analysis: Once subjects were selected for the analyses, z scores were computed on each student's 1985 math, 1985 language arts, 1984 math, and 1984 language arts results. These scores represent a student's raw score for a given test minus the mean score for a given test, the result of which is then divided by the standard deviation for that test. In all, there were 12 different tests involved, one for each of three grade levels, and one for each of two subject areas within a grade level for both 1984 and 1985. Although subgroups may have varying means that are dependent on the subgroup's performance, z scores guarantee that each of the tests will have the same mean, zero, and the

same standard deviation, one, when all the subjects taking a given test are included in the calculation. Using z scores statistically equates all the tests for difficulty level and makes it possible to compare a group's relative standing on different tests.

Two separate analyses of covariance (ANCOVA) were then performed. The analyses were identical with the exception that in one the dependent variable was the z score for 1985 math, whereas in another it was the z score for 1985 language arts. The analyses were (2 x 2 x 3 x 2) factorial designs, with an equal number of subjects per cell (550), in which there were two covariates: z score for 1984 math and z score for 1984 language arts.

The results, when significant, were converted from z score means into average percent correct on the Basic Skills Tests. This was done by multiplying the mean of a subgroup's z scores by the standard deviation of the average percent correct (APC) for a specified test. Because the standard deviation of all the z scores for a single test is equal to one, a z score of one for a particular subgroup represents one standard deviation above the mean in APCs. If a subgroup's z score is less than one, .5 for example, that z score represents exactly one-half a standard deviation above the mean in APC form (.5 x standard deviation in APC). The APC standard deviations used in the conversions were based only on those students included in the study.

The converted scores were then reported as differences between APCs for the FL and NFL groups on each of the six 1985 Basic Skills tests which were measured.

All test distributions were negatively skewed, causing the results to be conservative with respect to analysis of variance. This means that there is less chance of discovering a significant effect when one exits. When a significant effect is reported, however, it is likely to be more reliable than the statistical

probabilities imply (Levine & Dunlap, 1982, 1983).

Results: The analysis of covariance showed a main effect of second language study on 1985 language scores ($F = 114.77$, $p < .0001$)*, with second language students scoring higher than no second language students. There was also a significant interaction of grade level by second language study ($F = 10.23$, $p < .0001$) on language scores. Students taking a second language showed higher reading scores at grade 5 than did students in grades 3 and 4 (Figure 3). Both of the covariates, 1984 language scores and 1984 math scores, were significant predictors of 1985 language scores ($F = 3575.27$, $p < .0001$, and $F = 58.82$, $p < .0001$, respectively). This means that high scores in both subject areas of the 1984 tests were good predictors of high scores on the 1985 language arts test. Although the trend was not tested in this analysis, students taking a second language tended to have slightly higher 1984 language scores than those not taking a second language, whereas the reverse was true for 1984 math scores.

Significant main effects were found for sex ($F = 198.18$, $p < .0001$) and race ($F = 1586.25$, $p < .0001$), with females outperforming males and blacks scoring lower than other races. There was also a sex-by-grade-by-race interaction ($F = 29.79$, $p < .0001$) such that score differences between blacks and other races were greater for males and greater in the third grade, but the differences decreased as grade levels increased.

There were no significant interactions of sex or race with second language study.

An analysis of 1985 math scores showed no significant main effect of second language study. There was, however, a significant grade by second language effect ($F = 4.17$, $p = .0155$)*. Students of a foreign language showed some disadvantage on the 1985 math test in the fourth grade, but performed better than

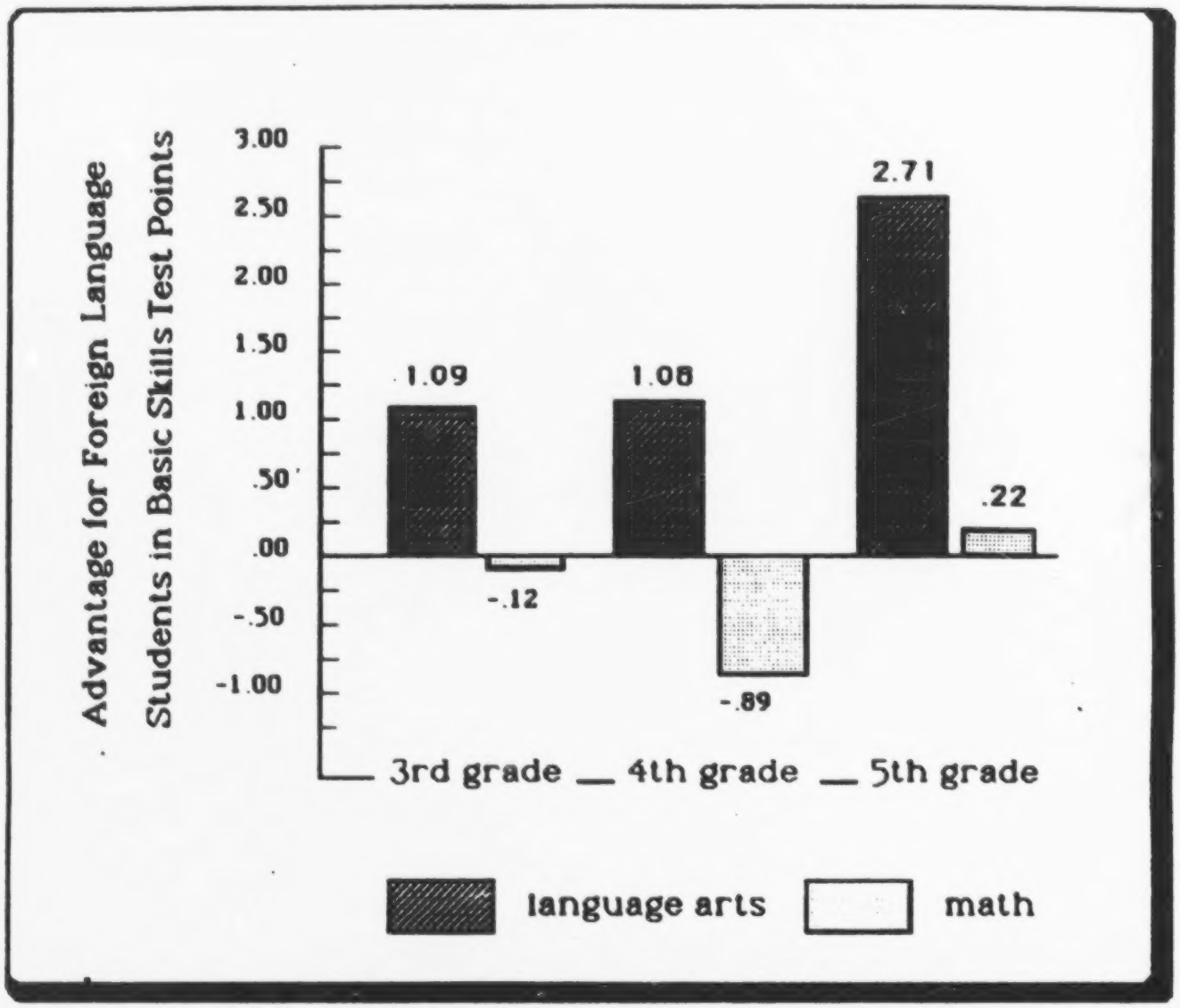

Figure 3. Third, fourth and fifth graders who participated in second language study in Louisiana's public schools showed significantly higher scores on the 1985 Basic Skills Language Arts tests than did a similar group of nonparticipants. By fifth grade foreign language students also showed an advantage on the Basic Skills Math tests.

Foreign language and no foreign language were matched for race, sex, and grade level. The academic level of students in both groups was estimated by their previous year's Basic Skills Test results, and statistically equated.

NFL students by the fifth grade (Figure 3). Both covariates, 1984 math scores and 1984 language scores, were significant predictors of 1985 math performance ($F = 848.96$, $p < .0001$, and $F = 1890.97$, $p < .0001$, respectively). High scorers on both 1984 tests were also high scorers on the 1985 math test. It is interesting to note that, although both tests were significant predictors of 1985 math performance, 1984 language scores were more reliable** than 1984 math scores in predicting 1985 math scores.

Sex and race showed significant main effects ($F = 39.43$, $p < .0001$, and $F = 86.78$, $p < .0001$, respectively). Males and blacks tended to perform less well than females and whites. Although males traditionally score higher than females on standardized mathematics tests, it has been shown that when a math test is closely tied to school curriculum, females usually perform better (Stockard, et al., 1985).

In math as in language arts, there were no significant interactions of race or sex with second language study.

Figure 3 combines the significant interactions involving second language participation from the two analyses. Because language arts and mathematics scores were analyzed separately, there can be no statistical comparison between the results pertaining to the two subject areas. The figure shows that third, fourth, and fifth grade FL students scored 1.09, 1.08, and 2.71, respectively, higher than NFL students on the language arts sections of the 1985 Basic Skills Tests. On the mathematics sections of the 1985 Basic Skills Tests, NFL students scored higher than FL students by .12 and .89 of a point in the third and fourth grades. Fifth grade FL students scored .22 of a point higher than NFL students on the mathematics test.

Significant effects that are related to second language study are presented in z score form in Appendix A.

* The expression, $p < .0001$, indicates that there is less than one chance in 10,000 that the reported effect does not reflect true differences. The expression, $p = .0155$, indicates that there are 155 chances in 10,000 that the reported effect does not reflect a true difference. In many journals reporting social research, a difference between means is considered significant if the chances of error are less than 5 in 100 ($p < .05$). In medicine, technology, and psychology an effect is considered significant if there is less than one chance in 100 ($p < .01$) of error.

** A significant difference is a reliable one, not necessarily a large one. Reliability, or significance, refers to the notion that if the study were repeated many different times, the results would not change appreciably. Significance does not indicate large differences between means, only that the differences that are found would likely be found again with the stated probability.

Discussion

Regardless of their race, sex, or academic level, students in foreign language (FL) classes outperformed those who were not taking foreign language (NFL) on the third, fourth, and fifth grade language arts sections of Louisiana's Basic Skills Tests. Foreign language study appears to increase the scores of boys as much as girls, and blacks as much as other races. This finding supports the notion that, beginning as early as the third grade, second language study facilitates the acquisition of minimum skills in the native tongue.

Although FL students at all the grade levels in the analysis showed higher scores than NFL students on language arts, the advantage was more than doubled for FL students in the fifth grade. Perhaps there is, as Dolson (1984) suggests, some cognitive confusion for FL students during early English literacy. This may explain the score increase for FL students at the fifth grade since by then, most children have mastered minimum English reading skills. Third and fourth grade FL students, however, also show a significant overall advantage over NFL students, suggesting that whatever difficulties FL students may have encountered in mastering these skills were compensated by the beneficial effects of foreign language study. The results of this study suggest that foreign language study aids, not hinders, the acquisition of English language arts skills. Students who are performing poorly in reading and language arts should be encouraged, not discouraged, from participating in foreign language study.

Acquisition of minimum math skills is more difficult to interpret. Overall, there was neither a significant advantage, nor disadvantage for FL students on the Basic Skills math sections. Once again, the results show that students of different races and sexes responded in much the same way as far as foreign language study was concerned.

There was, however, a significant difference for FL and NFL students with respect to grade level. That is, FL and NFL students performed differently depending on which grade was tested. Fourth grade FL students showed some disadvantage compared with NFL students, but by fifth grade the FL students were performing better than NFL students. This result seems to negate the assumption that by increasing the student's general cognitive level, his comprehension of mathematics is enhanced. If this were true, one might expect to see the largest advantages for FL students occurring at earlier grade levels. The Basic Skills tests, however, do not directly measure cognitive functioning. In fact, most tests of this kind measure which specific things a child can do, not his thought processes. This is particularly true of the easier tests that are given in the lower grade levels. Scores from tests designed to measure cognitive functioning may have indicated an advantage for FL students. The results of this analysis appear to support the recommendation that children who are performing poorly in math be given more mathematics tutoring in lieu of foreign language placement. The overall indications, though, are not so straightforward. The most significant predictor of success on the 1985 Basic Skills mathematics sections was the previous year's (1984) Basic Skills language scores. Insofar as FL study is related to increases in language scores, and language scores predict math scores, one would expect that FL study would eventually help raise math scores. Some explanation on this order may account for the turnaround for FL students in math at the fifth grade. It would be interesting to follow individual FL and NFL students who were performing poorly in math to see if this were the case.

Students who were not fluent in English, and/or were repeating a grade in 1985 were excluded from this study. These results, therefore, may not be directly generalizable to them.

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Appendix A

Results in Z Score Form

Overall Results

	FL	NFL
Language Arts*	.07	-.07
Mathematics	-.01	.01

Results by Grade Level

	FL	NFL
Language Arts*		
3rd grade	.05	-.05
4th grade	.06	-.06
5th grade	.12	-.12
Mathematics**		
3rd grade	-.005	.005
4th grade	-.04	.04
5th grade	.01	-.01

FL = foreign language students
NFL = students not taking a foreign language

* $p < .0001$

** $p = .0155$